EXHIBIT B

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

ART+COM INNOVATIONPOOL GMBH,	)	
	)	
Plaintiff,	)	
	)	
v.	)	C.A. No. 14-217 (RGA)
	)	
GOOGLE INC.,	)	
	)	
Defendant.	)	

FIRST SUPPLEMENTAL EXPERT REPORT OF DR. MICHAEL GOODCHILD
ON INVALIDITY OF U.S. PATENT NO. RE44,550

IV. BACKGROUND OF THE ART AND THE ALLEGED INVENTION

55. The disclosed technology generally relates to visualizing a large amount of geographical information utilizing common techniques.

56. The original vision for Geographical Information Systems ("GIS") dates from the mid-1960s and the Canada Geographic Information System, developed by Roger Tomlinson and IBM for the Government of Canada. Other stimuli included the work of the Bureau of the Census, the UK's Experimental Cartography Unit, and the Harvard Laboratory for Computer Graphics and Spatial Analysis. By 1972 an international community had begun to gel around the vision of a computer application capable of performing any conceivable operation on spatial data, that is, data recording what is present at specific locations on or near the Earth's surface. Harvard's ODYSSEY software led the way in the late 1970s.

57. By 1995 GIS was well established, and was widely used in applications ranging from forestry and resources management, to utilities management, transportation, social science, and archaeology—in short, in any field of human activity related to phenomena distributed over the surface and near-surface of the Earth. Commercial software was available from many companies, and the beginnings of an open-source software community were already established.

Courses were widely available at universities and colleges, and progress was being made at introducing GIS in the high-school curriculum.

58. Also by 1995 GIS were capable of acquiring, storing, analyzing, and distributing many types of spatial data, in several hundred alternative formats. At that time it was common to manage the data through a relational database management system ("RDBMS"), such as Oracle or Informix. Interest in using the Internet and World-Wide Web to support GIS was growing, and the first projects to exploit the Web for mapping and sharing data were under way.

59. By 1990-1991, the world of GIS had begun to utilize new workstations from Silicon Graphics to generate 3D representations of the Earth and moved beyond the digital equivalent of the flat, 2D paper map. Such models could be panned and zoomed on the screen, manipulating the 3D model as if it were a real globe. In my own lab we had developed this capability by 1991 and began publishing papers on the work (*see* M.F. Goodchild and Yang Shiren (1992) A hierarchical spatial data structure for global geographic information systems. Computer Vision, Graphics and Image Processing: Graphical Models and Image Processing 54(1): 31–44.)

60. In the original vision of GIS input data were provided in the form of maps, each of which was digitized to become a "layer" in the system. Each layer inherited the level of detail of its map, which might range from very coarse-scaled maps of the entire world to very fine-scaled maps of neighborhoods.

61. Some of these input maps would show much more information than others. For example, a topographic map of the Front Range of Colorado would show much more variation of elevation than a similar map from the Great Plains. If both maps were represented in raster, with identical cell sizes (for example, cells 30m on a side), and if elevations were captured to the

nearest meter, the Great Plains layer would include many cells with elevations identical to their neighbors, yet would have the same number of cells and therefore the same number of data elements. Storing every cell value of the Great Plains layer would include much repetition, whereas there would be much less repetition in the Front Range layer. In the 1970s storage was expensive, so there was substantial interest in finding ways of organizing data efficiently.

62. The quadtree was one well-known candidate. In the late 1970s, a Canadian company developed TYDAC SPANS, a complete, commercial GIS based on quadtrees. If an entire layer was "flat," with the same values in every cell of the layer, then only a single record was created. If not, the entire layer was divided into four equal subsections. Any section that was "flat" or constant was represented by a single record, and only those sections which contained variation in cell values was further subdivided. The process of subdivision continued until either all records were "flat" or constant, or until the size of the smallest section matched the data's initial cell size.

63. By 1995 the quadtree was routinely used in GIS software to shrink the size of data sets or to speed processing, or both.

64. While the quadtree can be seen as a method of controlling the level of detail in a spatial dataset, other methods were also in use by 1995. For vector data, culling algorithms were widely used to reduce the number of points required to represent a line or the boundary of an area, the most popular of them being the method attributed to Douglas and Peucker. *See* Longley *et al.*, Geographic Information Systems and Science 149-150 (2001 Wiley & Sons). In displaying spatial data, it was common to vary the level of detail such that areas closer to the eye were displayed with more detail, and detail was reduced in distant or peripheral areas. This allowed the system to reduce the amount of data in the field of view. When the eye was moving, this

technique was especially important in creating the impression of "flying" over the landscape by reducing the amount of data that would need to be displayed every time the screen was refreshed, which would typically be 25-30 times per second.

65. Additionally, the concept of space-related data or spatial data was a well-known concept by 1995 and even decades earlier. As one of the named inventors, Mr. Gerd Gruneis, admitted, "it must have been quite frequently used because every cartographer [] uses this term" as early as "1970 or in 1800s." Dep. Tr. of G. Gruneis (Jul. 14, 2015) at 36:11-25.

V. '550 PATENT SUMMARY

A. Background

66. The '550 patent was filed on February 21, 2013 and issued on October 22, 2013. The '550 patent is a reissue of U.S. Pat. No. RE41,428 (the "'428 patent"). The '428 patent was filed on December 31, 2007 and issued on July 13, 2010. The '428 patent is a reissue of U.S. Pat. No. 6,100,897 (the "'897 patent"). The '897 patent was filed on December 17, 1996 and issued on August 8, 2000. The '897 patent claims priority to a German patent application filed on December 22, 1995.

67. The '550 patent relates "to a method and a device for pictorial representation of space-related data, particularly geographical data of flat or physical objects." *See*, *e.g.*, '550 patent at 1:15-17.

68. The '550 patent describes alleged deficiencies in the prior art methods and devices that visualize geographical data. *See id.* at 1:34-61. Specifically, the '550 patent points to the prior art's use of "fixed data sets in order to generate the desired images." *Id*. at 1:42-44. "The resolution of the representation is therefore limited to the resolution of the [fixed] data sets stored in a memory unit." *Id*. at 1:44-46.

69. According to the ’550 patent, the alleged invention “enable[s] the [space-related] data to be represented in any pre-selected image resolution in the way in which the object would have been seen by an observer with a selectable location and selectable direction of view.” *Id*. at 2:3-8. It also “keep[s] the effort required for generating an image so low that . . . upon alteration of the location and/or of the direction of view of the observer, the impression of continuous movement above the object arises.” *Id*. at 2:8-13.

70. To achieve this objective, the ’550 patent describes a method for retrieving space-related data, such as geographical data of the Earth, to generate pictorial representations of the data. *See id*. at Abstract. The space-related data are stored in “spatially distributed data sources.” *Id*. at 2:18-20. Figure 1 of the ’550 patent (reproduced below) illustrates the spatially distributed data sources 4 that are coupled to computing devices 1, 2, and 3 via a data transmission network. *See id*. at 6:18-23.

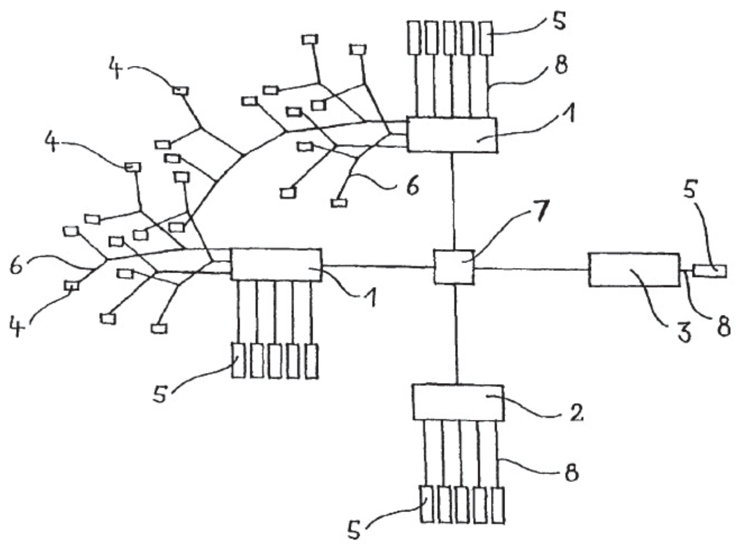

FIG. 1

71. An input medium (*e.g.*, a track ball) enables a user to select “both the location and the direction of view of the observer” that together establish a field of view. *Id*. at 7:26-31, 7:59-63. According to the specification, the field of view is determined by a selection of the location

and direction of view of the observer, and identifies "[t]he portion of an object to be observed," and is illustrated by the lines 17 in Fig. 3, below. *Id*. at 2:23-24, 8:18-25.

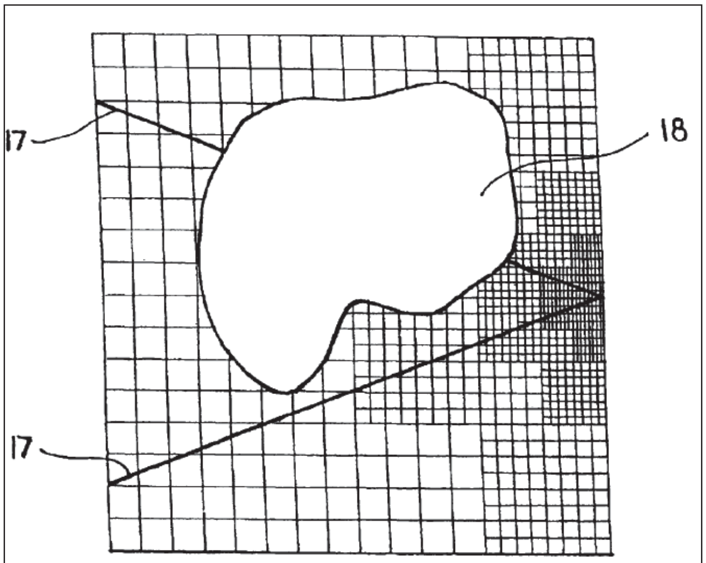

FIG. 3

72. The specification further discloses that once the field of view is established, the computing device retrieves space-related data associated with the field of view from the spatially distributed data sources and stores the retrieved data in a central storage. *See id*. at 7:59-67, Fig. 1. Then, the space-related data is transmitted from the central storage to a "display device" where a pictorial representation of space-related data is displayed. *See id*. at 7:63-8:3; Figs. 1, 2, 3.

73. The '550 patent discloses a hierarchical data structure that allows progressive sub-division of the field of view into smaller sections for generating a pictorial representation. For example, the '550 patent discloses implementing a quadtree representation of the field of view to support such progressive sub-division. *See id*. at 7:55-58. As illustrated in Fig. 4, below, each level of the quadtree corresponds to a particular level of "image resolution" as well as a smaller-sized section of the field of view (relative to a higher level of the quadtree). *Id*. at 4:4-13, 8:53-63, Fig. 4.

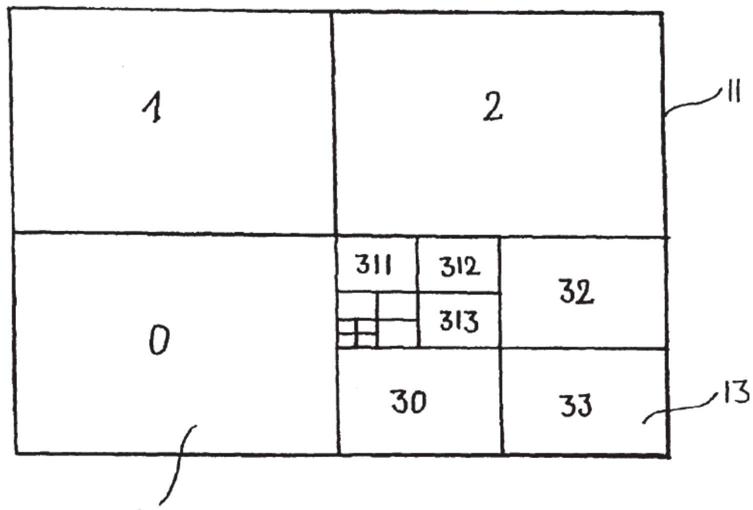

FIG.4

74. The progressive sub-division technique in the ’550 patent traverses the quadtree and retrieves space-related data for sections from at least one of the spatially distributed data sources until a “desired image resolution” for each section is achieved or no further data are available (*e.g.*, the bottom level of the tree is reached). *Id.* at 2:28-43, 7:55-58, 8:4-9.

75. Claim 1 is the only independent claim of the ’550 patent and is directed to: (a) providing a plurality of spatially distributed data sources, (b) determining a field of view, (c) requesting data for the field of view, (d) centrally storing the data, (e) representing the data for the field of view with one or more sections, and (f) recursively dividing, requesting and representing new, higher resolution data, (g) until all sections have the desired resolution or no further resolution data is available.

76. I have included this claim below for reference and refer to the individual limitations as noted in the claim itself (*e.g.*, 1a, 1b, etc.).

<u>Claim 1</u>

1. A method of providing a pictorial representation of space-related data of a selectable object, the representation corresponding to a view of the object by an observer with a selectable location and a selectable direction of view comprising:

(a) providing a plurality of spatially distributed data sources for storing space-related data;

(b) determining a field of view including an area of the object to be represented through a selection of a distance of the observer to the object and an angle of view of the observer to the object;

(c) requesting data for the field of view from at least one of the plurality of spatially distributed data sources;

(d) centrally storing the data for the field of view;

(e) representing the data for the field of view in a pictorial representation having one or more sections;

(f) using a computer, dividing each of the one or more sections having image resolutions below a desired image resolution into a plurality of smaller sections, requesting higher resolution space-related data for each of the smaller sections from at least one of the plurality of spatially distributed data sources, centrally storing the higher resolution space-related data, and representing the data for the field of view in the pictorial representation; and

(g) repeating step (f), dividing the sections into smaller sections, until every section has the desired image resolution or no higher image resolution data is available.